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POSITION PAPER ON ELECTRIC AND MAGNETIC POWER FREQUENCY FIELDS AND THE VELCO NORTHWEST VERMONT RELIABILITY PROJECT: UNDERGROUND SUPPLEMENT

PREPARED BY

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INTRODUCTION

This report is a further supplement to the Vermont Department of Health ("VDH") Position Paper dated December 17, 2003 ("VDH Position Paper") and May 20, 2004 ("NRP Proposed Reroutes") to address the electric and magnetic ("EMF") fields that would be expected from burial pursuant to an assumed design of sections of the proposed 115kV transmission line between New Haven and Queen City. This assumed design is generally referred to as the "Underground Cable." This report supplements the section of the VDH Position Paper beginning on page 23 of that report and entitled *"Will the Projected Electric and Magnetic Power Frequency Fields Increase, Decrease or Stay the Same with the NRP?"* to include underground transmission cables along the New Haven to Queen City corridor. Appendix E provides data and Appendix F provides the numerical results of the analysis provided by Power Delivery Consultants ("PDC"). Appendices G through J provide a comparison of the existing power line, the Proposed Reroutes and the Underground Cable This report analyzes and provides conclusions relating to EMF and the VELCO Proposed Underground Reroute. The reader should read this report in conjunction with the VDH Position Paper and should refer to that report for the VDH analysis of the scientific reports and EMF guidelines applied in the analyses.

In the absence of federal and state standards, the Vermont Department of Health applied the ICNIRP (833 mG, 4.2 kV/m) and IEEE (9,040 mG, 5 kV/m) guidelines for electric and magnetic power frequency fields to its analysis of the Underground Cable.

The rationale and methodology ICNIRP uses to determine the guidelines of 833 mG and 4.2 kV/m for EMFs follows:

> "Restrictions on the effects of exposure are based on established health effects and are termed basic restrictions. Depending on frequency, the physical quantities used to specify the basic restrictions on exposure to EMF are current density, SAR, and power density. Protection against adverse health effects requires that these basic restrictions are not exceeded.
>
> Reference levels of exposure are provided for comparison with measured values of physical quantities; compliance with all reference levels given in these guidelines will

ensure compliance with basic restrictions. If measured values are higher than reference levels, it does not necessarily follow that the basic restrictions have been exceeded, but a more detailed analysis is necessary to assess compliance with the basic restrictions."

"In the frequency range from a few Hz to 1 kHz, for levels of induced current density above 100 mA m^{-2}, the thresholds for acute changes in central nervous system excitability and other acute effects such as reversal of the visually evoked potential are exceeded. In view of the safety considerations above, it was decided that, for frequencies in the range 4 Hz to 1 kHz, occupational exposure should be limited to fields that induce current densities less than 10 mA m^{-2}, i.e., to use a safety factor of 10. For the general public an additional factor of 5 is applied, giving a basic exposure restriction of 2 mA m^{-2}." At a frequency of 60 Hz the basic exposure restriction of 2 mA m^{-2} translates to a reference level of 833 mG and 4.2 kV/m. ["Guidelines For Limiting Exposure To Time-Varying Electric, Magnetic, and Electromagnetic Fields (Up To 300 GHz)", ICNIRP, Health Physics Society, 1998].

The VDH concludes that the electric power frequency field strength for the Underground Cable does not appear to be a public health hazard due to the shielding effect of the concrete duct bank and overlying soil.

The projected magnetic power frequency fields for adults at the edge of the ROW and directly over the underground transmission cable at average and maximum continuous load with the Underground Cable are less than the health-based ICNIRP guideline of 833 mG.

The magnetic power frequency field for the Underground Cable may pose a public health hazard for children in particular directly over the underground transmission cable with projected maximum continuous current loads (1,062 mG and 5,308 mG). When comparing the proposed underground transmission cable with the proposed overhead power lines of the NRP and Reroutes the mode of transmission emitting the lowest EMF should be adopted. A few methods of reducing exposure to EMF from an underground transmission cable are: 1) maintain the ROW in a manner which would restrict its use as a recreational area, such as a bike path, play area, snowmobile path, etc., 2) site the recreational area at least 10 feet away from the center of the underground transmission cable duct bank, or 3) insert a layer of ferro-magnetic material, as shielding, above the concrete duct bank to decrease the power frequency magnetic field directly above the underground transmission cable.

The maximum projected magnetic power frequency field at 10 feet from the vertical transition structure of the power line from underground to overhead (or vice versa) for the Underground Cable is 151 mG for maximum continuous loading. This demonstrates that the projected magnetic power frequency field from the transition structure is well below the health-based ICNIRP guideline of 833 mG.

WILL THE PROJECTED ELECTRIC AND MAGNETIC POWER FREQUENCY FIELDS INCREASE, DECREASE OR STAY THE SAME WITH THE UNDERGROUND TRANSMISSION CABLES?

This report analyzes potential EMF resulting from underground transmission cables in an assumed design along the New Haven to Queen City corridor. The design parameters provided to PDC from the VDH are contained in Appendix E. Data required for the calculations include: 1) range of projected average loading, 2) projected maximum loading, 3) distance away from the underground power line, 4) depth of the concrete duct bank, 5) target height above ground, 6) type of concrete duct bank, 7) number of conductors, 8) conductor size, and 9) phase angle. PDC calculated the magnetic power frequency fields using the Power Cable ToolBox program and the results are contained in Appendix F.

For purposes of this analysis, the VDH assumed the underground transmission cables will be installed in a concrete duct bank, 26 inches wide by 26 inches high, containing 4 six inch conduits for transmission cables and two smaller conduits for communications fibers. The proposed transmission cables in three of the conduits will be energized. The transmission cable in the remaining conduit will be grounded at one end and therefore, will not conduct current and will not impact the magnetic power frequency field strength. Installation of non-conducting parallel fiber optic cables in the duct bank will not impact the magnetic power frequency field strength because they do not conduct current.

The depth of the top surface of the concrete duct bank is assumed to be 28 inches below the surface of the ground. The magnetic power frequency field is not affected by the concrete duct bank nor the overlying soil because most materials, except ferromagnetic metals, have a relative magnetic permeability of approximately 1.0 and do not provide magnetic shielding. It is assumed that the concrete of the duct bank and the soil surrounding the concrete duct bank do not contain iron bearing material and thus will not impact the magnetic field.

There is not expected to be an electric power frequency field above the Underground Cable and, therefore, the electric power frequency field is not a health concern. This is due to shielding from the concrete duct bank and the overlying soil.

The ROW of the Proposed Reroutes from the New Haven Substation to the Queen City Substation ranges from 60 feet to 100 feet. In a couple of locations the ROW is greater than 100 feet. Calculations were performed using a 40-foot ROW based on the shortest distance to existing homes in the proposed corridor from the underground transmission cable.

Using these parameters and assumptions the estimated projected results are maximum possible values for the magnetic power frequency fields. The results of these calculations are very conservative estimates and are not “real” or measured fields and could vary depending on the underground design employed (Appendix F).

MAGNETIC POWER FREQUENCY FIELDS AT AVERAGE LOADING AT THE EDGE OF THE RIGHT OF WAY (APPENDIX G, TABLE 2)

REROUTE CORRIDORS - UNDERGROUND CABLE

The magnetic power frequency field at the edge of the Vergennes reroute corridor is projected to increase[1] with the Underground Cable along the ROW for average loading from 3.3 mG in 2006 to 4.5 mG in 2012.

The magnetic power frequency field at the edge of the Little Chicago Road reroute corridor is projected to increase with the Underground Cable along the ROW for average loading from 2.7 mG in 2006 to 3.9 mG in 2012.

The magnetic power frequency field at the edge of the Shelburne reroute corridor is projected to increase with the Underground Cable along the ROW for average loading from 1.4 mG in 2006 to 2.4 mG in 2012.

The magnetic power frequency field at the edge of the Charlotte reroute corridor is projected to increase with the Underground Cable along the ROW for average loading from 2.5 mG in 2006 to 3.6 mG in 2012.

The magnetic power frequency field for average loading at the edge of the ROW is projected to increase very slightly with the Underground Cable for the Vergennes, Little Chicago Road, Shelburne, and Charlotte reroute corridors between 2006 and 2012. The projected magnetic power frequency field for average loading at the edge of the ROW along the reroute corridors ranges from 2.4 to 4.5 mG and the average is approximately 3.4 mG in 2012. The projected magnetic power frequency fields at the edge of the ROW are approximately 250 and 2500 times less than the ICNIRP and IEEE guidelines, respectively, for public exposure.

ORIGINAL CORRIDORS - UNDERGROUND CABLE

The magnetic power frequency field along the New Haven to Vergennes corridor is projected to increase slightly with the Underground Cable at the edge of the ROW for average loading from 3 mG in 2003 to 3.3 mG in 2006 and 4.5 mG in 2012. It is projected that if the existing 34.5 kV overhead power line continues to be used the magnetic power frequency field will remain approximately the same in 2012 (3.8 mG).

[1] When the Underground Cable is in a new transmission corridor of the Proposed Reroutes the concept of "increase" relates to the increase in electric or magnetic power frequency fields between the year of installation (2006) and 2012. Since the magnetic power frequency field is proportional to the current, the VDH is able to calculate the projected magnetic power frequency field from the results provided by PDC (Appendix F) along all corridors of the Proposed Reroute.

The magnetic power frequency field along the Vergennes to North Ferrisburg corridor is projected to decrease with the Underground Cable at the edge of the ROW for average loading from 11 mG in 2003 to 2.7 mG in 2006 and 3.9 mG in 2012. It is projected that if the existing 34.5 kV overhead power line continues to be used the magnetic power frequency field will increase to 18 mG in 2012.

The magnetic power frequency field along the North Ferrisburg to Charlotte corridor is projected to decrease with the Underground Cable at the edge of the ROW for average loading from 6.1 mG in 2003 to 2.5 mG in 2006 and 3.6 mG in 2012. It is projected that if the existing 34.5 kV overhead power line continues to be used the magnetic power frequency field will increase to 12 mG in 2012.

The magnetic power frequency field along the Charlotte to Shelburne corridor is projected to increase slightly with the Underground Cable at the edge of the ROW for average loading from 1.9 mG in 2003 to 2.0 mG in 2006 and 3.2 mG in 2012. It is projected that if the existing 34.5 kV overhead power line continues to be used the magnetic power frequency field will remain approximately the same in 2012 (1.8 mG).

The magnetic power frequency field along the Shelburne to Queen City Substation corridor is projected to decrease with the Underground Cable at the edge of the ROW for average loading from 14 mG in 2003 to 1.4 mG in 2006 and 2.4 mG in 2012. It is projected the magnetic power frequency field will also remain approximately the same if the existing 34.5 kV overhead power line continues to be used up through 2012 (16 mG).

The magnetic power frequency field for average loading at the edge of the ROW is projected to decrease with the Underground Cable for the New Haven to Queen City Substation corridor between 2003 and 2012. The projected magnetic power frequency field for average loading at the edge of the ROW along the New Haven to Queen City Substation corridor ranges from 2.4 to 4.5 mG and the average is approximately 3.5 mG in 2012. The projected magnetic power frequency fields at the edge of the ROW are approximately 250 and 2500 times less than the ICNIRP and IEEE guidelines, respectively

CONCLUSION

The magnetic power frequency fields at the edge of the ROW for average loading with the Underground Cable are projected to be on the order of 250 times less than the ICNIRP guideline of 833 mG, and 2500 times less than the IEEE guideline of 9,040 mG for public exposure. This demonstrates that the projected maximum magnetic power frequency field at average loading at the edge of the ROW for the Underground Cable is well below the health-based ICNIRP guidelines.

MAGNETIC POWER FREQUENCY FIELDS AT AVERAGE LOADING DIRECTLY OVER THE UNDERGROUND TRANSMISSION CABLES (APPENDIX G, TABLE 1)

REROUTE CORRIDORS – UNDERGROUND CABLE

The magnetic power frequency field along the Vergennes reroute corridor is projected to increase with the Underground Cable for average loading directly over the power lines from 33 mG in 2006 to 45 mG in 2012.

The magnetic power frequency field along the Little Chicago Road reroute corridor is projected to increase with the Underground Cable for average loading directly over the power lines from 27 mG in 2006 to 39 mG in 2012.

The magnetic power frequency field along the Shelburne reroute corridor is projected to increase with the Underground Cable for average loading directly over the power lines from 14 mG in 2006 to 24 mG in 2012.

The magnetic power frequency field along the Charlotte reroute corridor is projected to increase with the Underground Cable for average loading directly over the power lines from 25 mG in 2006 to 36 mG in 2012.

The magnetic power frequency field for average loading directly over the power line is projected to increase with the Underground Cable for the Vergennes, Little Chicago Road, Shelburne, and Charlotte reroute corridors between 2006 and 2012. The projected magnetic power frequency field for average loading directly over the underground cable along the reroutes ranges from 24 mG to 45 mG and the average is approximately 36 mG in 2012. The projected magnetic power frequency fields directly over the power line are approximately 20 and 250 times less than the ICNIRP and IEEE guidelines, respectively, for public exposure.

ORIGINAL CORRIDORS - UNDERGROUND CABLE

The magnetic power frequency field along the New Haven to Vergennes corridor is projected to increase with the Underground Cable from 10 mG in 2003 to 33 mG in 2006 and to 45 mG in 2012 for average loading directly over the underground transmission cables. It is projected that if the existing 34.5 kV overhead power line continues to be used the magnetic power frequency field will be 13 mG in 2012.

The magnetic power frequency field along the Vergennes to North Ferrisburg corridor is projected to increase with the Underground Cable from 14 mG in 2003 to 27 mG in 2006 and to 39 mG in 2012 for average loading directly over the underground transmission cables. It is projected that if the existing 34.5 kV overhead power line from Vergennes to the Queen City Substation continues to be used the magnetic power frequency field will be 23 mG in 2012.

The magnetic power frequency field along the North Ferrisburg to Charlotte corridor is projected to increase with the Underground Cable from 7.6 mG in 2003 to 25 mG in 2006 and to 36 mG in 2012 for average loading directly over the underground transmission cables. It is projected that if the existing 34.5 kV overhead power line continues to be used the magnetic power frequency field will be 15 mG in 2012.

The magnetic power frequency field along the Charlotte to Shelburne corridor is projected to increase with the Underground Cable from 2.4 mG in 2003 to 20 mG in 2006 and to 32 mG in 2012 for average loading directly over the underground transmission cables. It is projected that if the existing 34.5 kV overhead power line continues to be used the magnetic power frequency field will remain approximately the same in 2012 (2.2 mG).

The magnetic power frequency field along the Shelburne to Queen City Substation corridor is projected to decrease with the Underground Cable from 18 mG in 2003 to 14 mG in 2006 and increase to 24 mG in 2012 for average loading directly over the underground transmission cables. It is projected the magnetic power frequency field will remain approximately the same if the existing 34.5 kV overhead power line from Vergennes to the Queen City Substation continues to be used up through 2012 (19 mG).

The magnetic power frequency field for average loading over the power line is projected to increase with the Underground Cable for the New Haven to Queen City Substation corridor between 2003 and 2012. The projected magnetic power frequency field for average loading directly over the underground transmission cables ranges from 24 mG to 45 mG and the average is approximately 35 mG in 2012. The projected magnetic power frequency fields for average loading directly over the power line are approximately 20 and 250 times less than the ICNIRP and IEEE guidelines, respectively.

CONCLUSION

The magnetic power frequency fields with the Underground Cable for average loading directly over the underground transmission cables are projected to be on the order of 20 times less than the ICNIRP guideline of 833 mG and 250 times less than the IEEE guideline of 9,040 mG for public exposure, respectively. This demonstrates that the projected maximum magnetic power frequency field at average loading at the edge of the ROW for the Underground Cable is well below the health-based ICNIRP guidelines.

MAGNETIC POWER FREQUENCY FIELDS AT MAXIMUM CONTINUOUS LOADING AT THE EDGE OF THE ROW (APPENDIX G, TABLE 3)

The maximum projected magnetic power frequency field along the Vergennes, Little Chicago Road, Shelburne, and Charlotte reroute corridors is 27 mG for the Underground Cable for maximum continuous loading at the edge of the ROW. The projected magnetic power frequency field is approximately 30 and 300 times less than the ICNIRP and IEEE guidelines for public exposure, respectively.

The maximum existing and projected magnetic power frequency fields along the New Haven to Vergennes corridor are 12 and 27 mG, respectively for the Underground Cable for maximum continuous loading at the edge of the ROW. The maximum existing and projected magnetic power frequency fields along the Vergennes to Charlotte corridor are 96 and 27 mG, respectively for the Underground Cable at maximum continuous loading at the edge of the ROW. The maximum existing and projected magnetic power frequency fields along the Charlotte to Queen City Substation corridor are 75 and 27 mG, respectively for the Underground Cable at maximum continuous loading at the edge of the ROW. The projected magnetic power frequency field at the edge of the ROW for maximum continuous loading is approximately 30 and 300 times less than the ICNIRP and IEEE guidelines for public exposure, respectively.

The magnetic power frequency field for maximum continuous loading at the edge of the ROW is projected to decrease from an average of approximately 86 mG to 27 mG with the Underground Cable for the New Haven to Queen City Substation corridor. The projected magnetic power frequency field at the edge of the ROW for maximum continuous loading is approximately 30 and 300 times less than the ICNIRP and IEEE guidelines for public exposure, respectively.

CONCLUSION

The magnetic power frequency fields at the edge of the ROW with the Underground Cable for maximum continuous loading are projected to be approximately 30 times less than the ICNIRP guideline of 833 mG, and 300 times less than the IEEE guideline of 9,040 mG for public exposure. This demonstrates that the projected maximum magnetic power frequency field for maximum loading at the edge of the ROW for the Underground Cable is well below the health-based ICNIRP guideline.

MAGNETIC POWER FREQUENCY FIELDS AT MAXIMUM CONTINUOUS LOADING DIRECTLY OVER THE UNDERGROUND TRANSMISSION CABLES (APPENDIX G, TABLE 3)

The magnetic power frequency field for the Underground Cable along the Vergennes, Little Chicago Road, Shelburne, and Charlotte reroute corridors is projected to be 272 mG for maximum loading directly over the underground transmission cables.

There is a projected increase, from approximately 95 mG to 272 mG, with the Underground Cable in the magnetic power frequency field for maximum continuous loading directly over the power line for the New Haven to Queen City Substation corridor. The projected magnetic power frequency fields directly over the proposed underground transmission cables for maximum continuous loading are approximately 3 and 30 times less than the ICNIRP and the IEEE guidelines for public exposure, respectively.

CONCLUSION

The magnetic power frequency fields with the Underground Cable for maximum loading directly over the underground transmission cables are expected to be on the order of 3 and 30 times less than the ICNIRP guideline of 833 mG and the IEEE guideline of 9,040 mG for public exposure, respectively. This demonstrates that the projected maximum magnetic power frequency fields for maximum loading directly over the power lines for the Underground Cable are well below the health-based ICNIRP guideline.

SUMMARY

In summary, the projected magnetic power frequency fields for adults with the Underground Cable at the edge and in the ROW are less than the health-based ICNIRP guideline of 833 mG and the IEEE guideline of 9,040 mG for public exposure. This demonstrates that the projected magnetic power frequency fields for adults at the edge of the ROW and directly over the underground transmission cables for the Underground Cable corridors along the New Haven to Queen City corridor are well below the health-based ICNIRP guidelines.

WHAT WILL BE THE STRENGTH OF THE PROJECTED MAGNETIC POWER FREQUENCY FIELD AT THE GROUND SURFACE? (APPENDIX I)

Consideration of the strength of the projected magnetic power frequency field from a 28 inch deep underground transmission cable at the ground surface is important in order to determine whether the strength of the field will be such that it could pose an adverse health effect to children who may use the cleared right of way for recreational purposes. In the case of overhead power lines the projected magnetic power frequency field strength at ground surface will be less than that calculated for adults (3.28 feet above the ground) since the surface of the ground is further away from the overhead power lines.

The magnetic power frequency field for the Underground Cable is projected to range from 2.6 to 4.9 mG for average loading at the edge of the right of way in 2012 (Table 2), approximately 2 times less than if the existing overhead power lines continue to be used and 10 times less than the Proposed Reroute. The magnetic power frequency field for the Underground Cable is projected to range from 94 to 177 mG for average loading directly over the underground transmission cables in 2012 (Table 1), approximately 10 times more than if the existing overhead power lines continue to be used and 4 times more than the Proposed Reroute. This demonstrates that the projected magnetic power frequency fields for children for average loading at the edge of the ROW and directly over the underground transmission cables for the Underground Cable are below the health-based ICNIRP guidelines.

The magnetic power frequency field for the Underground Cable is projected to be 29 mG for maximum continuous loading at the edge of the right of way (Table 3), approximately 3 times less than if the existing overhead power lines continue to be used and 8 times less than the Proposed Reroute. This demonstrates that the projected magnetic power frequency fields for children for maximum continuous loading at the edge of the ROW for the Underground Cable are well below the health-based ICNIRP guidelines.

The magnetic power frequency field for Underground Cable is projected to be 1,062 mG for maximum continuous loading directly over the underground transmission cables (Table 3), approximately 10 times more than if the existing overhead power lines continue to be used, and 4 times more than the Proposed Reroute. This result exceeds the ICNIRP guideline of 833 mG and is less than the IEEE guideline of 9,040 mG. The magnetic power frequency field drops to 833 mG at approximately 3 feet from the center of the underground transmission cable duct bank. When comparing the proposed underground transmission cable with the proposed overhead power lines of the NRP and Reroutes, the mode of transmission emitting the lowest EMF should be adopted.

WHAT WILL BE THE STRENGTH OF THE PROJECTED MAGNETIC POWER FREQUENCY FIELD IF THE DUCT BANK IS CONSTRUCTED CLOSE TO THE GROUND SURFACE? (APPENDIX H & J)

Consideration of the strength of the projected magnetic power frequency field from an underground power line constructed near the surface of the ground, at the ground surface and 3.28 feet above ground, is important in order to determine whether the strength of the field will be such that it could pose an adverse health effect to children and adults, respectively, who may use the cleared right of way for recreational purposes. It is assumed that the minimum fill depth above the duct bank will consist of at least 6 inches of soil.

TARGET AT 3.28 FEET (ADULT)

The magnetic power frequency field for the Underground Cable is projected to range from 2.5 to 4.7 mG for average loading at the edge of the right of way in 2012 (Appendix H, Table 2), approximately 2 times less than if the existing overhead power lines are continued to be used and 10 times less than the Proposed Reroute. The magnetic power frequency field for the Underground Cable is projected to range from 46 to 87 mG for average loading directly over the underground transmission cables in 2012 (Appendix H, Table 1), approximately 4 times more than if the existing overhead power lines are continued to be used and 2 times more than the Proposed Reroute. This demonstrates that the projected magnetic power frequency fields for adults for average loading directly over the underground transmission cables and at the edge of the ROW for the Underground Cable are well below the health-based ICNIRP guidelines.

The magnetic power frequency field for the Underground Cable is projected to be 28 mG for maximum continuous loading at the edge of the right of way (Appendix H Table 3), approximately 3 times less than if the existing overhead power lines are continued to be used and 10 times less than the Proposed Reroute. The magnetic power frequency field for the Underground Cable is projected to be 519 mG for maximum continuous loading directly over the underground transmission cables (Appendix H, Table 3), approximately 6 times more than if the existing overhead power lines are continued to be used and 2 times more than the Proposed Reroute. This demonstrates that the projected magnetic power frequency fields for adults for maximum continuous loading directly over the underground transmission cables and at the edge of the ROW for the Underground Cable are below the health-based ICNIRP guidelines. However, when comparing the proposed underground transmission cable with the proposed overhead power lines of the NRP and Reroutes, the mode of transmission emitting the lowest EMF should be adopted.

TARGET AT GROUND SURFACE (CHILD)

The magnetic power frequency field for the Underground Cable is projected to range from 2.6 to 5.0 mG for average loading at the edge of the right of way in 2012 (Appendix J, Table 2), approximately 2 times less than if the existing overhead power lines are continued to be used and 10 times less than the Proposed Reroute. This demonstrates that the projected magnetic power frequency fields for children for average loading at the edge of the ROW for the Underground Cable are well below the health-based ICNIRP guidelines.

The magnetic power frequency field for the Underground Cable is projected to range from 469 to 886 mG for average loading directly over the underground transmission cables in 2012 (Appendix J, Table 1), approximately 39 times more than if the existing overhead power lines are continued to be used, and 18 times more than the Proposed Reroute. The magnetic power frequency field exceeds the ICNIRP guideline of 833 mG and is less than the IEEE guideline of 9,040 mG along the New Haven to Vergennes corridor and the Vergennes Proposed Reroute. The magnetic power frequency field drops to 833 mG at approximately 1 foot from the center of the duct bank. When comparing the proposed underground transmission cable with the proposed overhead power lines of the NRP and Reroutes, the mode of transmission emitting the lowest EMF should be adopted.

The magnetic power frequency field for the Underground Cable is projected to be 30 mG for maximum continuous loading at the edge of the right of way (Appendix J, Table 3), approximately 3 times less than if the existing overhead power lines are continued to be used and 9 times less than the Proposed Reroute. This demonstrates that the projected magnetic power frequency fields for children for maximum continuous loading at the edge of the ROW for the Underground Cable are well below the health-based ICNIRP guidelines.

The magnetic power frequency field for the Underground Cable is projected to be 5,308 mG for maximum continuous loading directly over the underground transmission cables (Appendix J, Table 3), approximately 50 times more than if the existing overhead power lines are continued to be used, and 19 times more than the Proposed Reroute This result exceeds the

ICNIRP guideline of 833 mG and is less than the IEEE guideline of 9,040 mG. The magnetic power frequency field drops to 833 mG at approximately 3.5 feet from the center of the duct bank. When comparing the proposed underground transmission cable with the proposed overhead power lines of the NRP and Reroutes, the mode of transmission emitting the lowest EMF should be adopted.

WHAT WILL BE THE STRENGTH OF THE PROJECTED MAGNETIC POWER FREQUENCY FIELD FOR THE VERTICAL COMPACT UNDERGROUND-TO-OVERHEAD TRANSITION STRUCTURE? (APPENDIX F, TABLE 5)

PDC used the following assumptions for calculating the magnetic power frequency field from a vertical transition structure: 1) cables are clamped to the side of a steel pole, 2) cables are in the same plane (straight line) on a bracket attached to the pole, 3) approximate center to center spacing of the cables is two cable diameters or 8.7 inches, 4) calculated magnetic fields are from the vertical cables only and do not include the impact of the underground sections or 90 degree sweep as the cables transition to vertical, 5) pole does not impact the magnetic field distribution, and 6) there is no current flowing in the riser pole.

The projected magnetic power frequency field at 10 feet from the vertical transition structure of the power line from underground to overhead (or vice versa) for the Underground Cable is projected to range from 7.7 to 25.2 mG for average loading and is 150.8 mG for maximum continuous loading. This demonstrates that the projected magnetic power frequency field is well below the health-based ICNIRP guideline of 833 mG.

CONCLUSIONS FOR THE UNDERGROUND TRANSMISSION CABLES

In the absence of federal and state standards, the Vermont Department of Health applied the ICNIRP (833 mG, 4.2 kV/m) and IEEE (9,040 mG, 5 kV/m) guidelines for electric and magnetic power frequency fields to its analysis of the Underground Cable.

The VDH concludes that the electric power frequency field strength for the Underground Cable does not appear to be a public health hazard due to the shielding effect of the concrete duct bank and overlying soil.

The projected magnetic power frequency fields for adults at the edge of the ROW and directly over the underground transmission cable at average and maximum continuous load with the Underground Cable are less than the health-based ICNIRP guideline of 833 mG.

The magnetic power frequency field for the Underground Cable may pose a public health hazard for children directly over the underground transmission cables with projected maximum continuous current loads (1,062 mG and 5,308 mG) and directly over the underground transmission cables for average current load (886 mG). When comparing the proposed underground transmission cable with the proposed overhead power lines of the NRP and Reroutes, the mode of transmission emitting the lowest EMF should be adopted. A few methods of reducing exposure to EMF from an underground transmission cable are: 1) maintain the ROW in a manner which would restrict its use as a recreational area, such as a bike path, play area, snowmobile path, etc., 2) site the recreational area at least 10 feet away from the center of the underground transmission cable duct bank, or 3) insert a layer of ferro-magnetic material, as shielding, above the concrete duct bank to decrease the power frequency magnetic field directly above the underground transmission cable.

The maximum projected magnetic power frequency field at 10 feet from the vertical transition structure of the power line from underground to overhead (or vice versa) for the Underground Cable is 151 mG for maximum continuous loading. This demonstrates that the projected magnetic power frequency field from the transition structure is well below the health-based ICNIRP guideline of 833 mG.

APPENDIX E

DATA PROVIDED TO PDC FOR ANALYSIS

CONDUCTOR SIZE

3000 kcmil

CONTINUOUS LOAD RATINGS (AMPS)

Average Low	76
Average High	249
Maximum	1492

DISTANCE AWAY FROM UNDERGROUND POWER LINE (FEET)

Directly Over Power Line	0
20 Foot ROW	10
40 Foot ROW	20

DEPTH OF TOP SURFACE OF CONCRETE CONDUIT BANK (INCHES)

GROUND SURFACE	6	(trench depth of 32 inches)
BELOW SURFACE	28	(trench depth of 54 inches)

TARGET HEIGHT ABOVE GROUND

0 feet

3.28 feet

APPENDIX F

RESULTS PROVIDED TO VDH FROM PDC

Table 1.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE AND MAXIMUM LOADING (milliGauss)

	3.28 FEET ABOVE GROUND / 28” DEPTH DUCT BANK LOAD (Amp)		
ROW (feet)	76	249	1492
0	14	45	272
20	4.3	14	84
40	1.4	4.5	27

Table 2.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE AND MAXIMUM LOADING (milliGauss)

	3.28 FEET ABOVE GROUND / 6” DEPTH DUCT BANK LOAD (Amp)		
ROW (feet)	76	249	1492
0	26	87	519
20	5	16	98
40	1.4	4.7	28

Table 3.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE AND MAXIMUM LOADING (milliGauss)

	0 FEET ABOVE GROUND / 28” DEPTH DUCT BANK LOAD (Amp)		
ROW (feet)	**76**	**249**	**1492**
0	54	177	1062
20	5.5	18	108
40	1.5	4.9	29

Table 4.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE AND MAXIMUM LOADING (milliGauss)

	0 FEET ABOVE GROUND / 6” DEPTH DUCT BANK LOAD (Amp)		
ROW (feet)	**76**	**249**	**1492**
0	270	886	5308
20	6.0	20	118
40	1.5	5.0	30

Table 5.

MAGNETIC POWER FREQUENCY FIELDS FROM POWER LINES ON RISERS AT A DISTANCE OF 10 FEET

Current (Amps)	Magnetic Field (milliGauss)
76	7.7
249	25.2
1492	150.8

APPENDIX G

TARGET AT 3.28 FEET ABOVE GROUND AND DUCT BANK AT 28 INCH DEPTH

Table 1.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE LOADING DIRECTLY UNDER THE OVERHEAD POWER LINE AND OVER THE UNDERGROUND TRANSMISSION CABLES

(milliGauss)

	Existing Power Line				Proposed Power Line - Reroute			Underground	
Corridor*	2003	2006	2009	2012	2006	2009	2012	2006	2012
Ver	NA**	NA	NA	NA	34	42	47	33	45
LCR	NA	NA	NA	NA	28	36	41	27	39
Shel	NA	NA	NA	NA	21	28	33	14	24
Char	NA	NA	NA	NA	26	33	38	25	36
NH – V	10	11	12	13	34	42	47	33	45
V – NF	14	19	21	23	28	36	41	27	39
NF – C	7.6	12	14	15	26	33	38	25	36
C – S	2.4	1	1.4	2.2	21	28	33	20	32
S – QC51	18	17	17	19	15	21	25	14	24
QC51 – 58	45	50	56	62	25	26	28	14	24
QC58 – 67	40	46	52	57	28	29	31	14	24
QC67 – QC	39	45	52	57	30	31	34	14	24

*Unless designated as a reroute, the corridor is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
**NA = Not applicable

Table 2.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE LOADING ON THE EDGE OF THE RIGHT OF WAY*
(milliGauss)

Corridor**	Existing Power Line				Proposed Power Line - Reroute			Underground	
	2003	**2006**	**2009**	**2012**	**2006**	**2009**	**2012**	**2006**	**2012**
Ver	NA***	NA	NA	NA	22	27	31	3.3	4.5
LCR	NA	NA	NA	NA	18	23	26	2.7	3.9
Shel	NA	NA	NA	NA	14	18	21	1.4	2.4
Char	NA	NA	NA	NA	17	21	25	2.5	3.6
NH – V	3	3.3	3.5	3.8	34	42	47	3.3	4.5
V – NF	11	15	17	18	27	35	39	2.7	3.9
NF – C	6.1	10	11	12	25	32	37	2.5	3.6
C – S	1.9	0.8	1.1	1.8	21	28	33	2.0	3.2
S – QC51	14	13	14	16	14	20	24	1.4	2.4
QC51 – 58	45	50	56	62	20	21	22	1.4	2.4
QC58 – 67	38	44	50	54	28	29	31	1.4	2.4
QC67 – QC	37	43	49	53	23	24	27	1.4	2.4

*40 foot ROW for all corridors

** Unless designated as a reroute, the corridor
is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
***NA = Not applicable

Table 3.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT MAXIMUM CONTINUOUS RATED LOAD DIRECTLY UNDER THE OVERHEAD POWER LINE, OVER THE UNDERGROUND TRANSMISSION CABLES AND AT THE EDGE OF THE RIGHT OF WAY

(milliGauss)

	Existing Power Line		Proposed Power Line - Reroute		Underground	
Corridor*	**Maximum**	**ROW Edge****	**Maximum**	**ROW Edge****	**Maximum**	**ROW Edge**
Ver	NA***	NA	282	183	272	27
LCR	NA	NA	282	183	272	27
Shel	NA	NA	282	183	272	27
Char	NA	NA	282	183	272	27
NH – V	41	12	282	282	272	27
V – NF	121	96	282	274	272	27
NF – C	121	96	282	274	272	27
C – S	94	75	282	282	272	27
S – QC51	94	75	282	274	272	27
QC51 – 58	176	176	223	189	272	27
QC58 – 67	218	208	281	281	272	27
QC67 – QC	215	204	286	286	272	27

* Unless designated as a reroute, the corridor is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
**40 foot ROW for all corridors
***NA = Not applicable

APPENDIX H

TARGET AT 3.28 FEET ABOVE GROUND AND DUCT BANK AT 6 INCH DEPTH

Table 1.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE LOADING DIRECTLY UNDER THE OVERHEAD POWER LINE AND OVER THE UNDERGROUND TRANSMISSION CABLES

(milliGauss)

	Existing Power Line				Proposed Power Line - Reroute			Underground	
Corridor*	2003	2006	2009	2012	2006	2009	2012	2006	2012
Ver	NA**	NA	NA	NA	34	42	47	63	87
LCR	NA	NA	NA	NA	28	36	41	52	75
Shel	NA	NA	NA	NA	21	28	33	26	46
Char	NA	NA	NA	NA	26	33	38	47	70
NH – V	10	11	12	13	34	42	47	63	87
V – NF	14	19	21	23	28	36	41	52	75
NF – C	7.6	12	14	15	26	33	38	47	70
C – S	2.4	1	1.4	2.2	21	28	33	39	60
S – QC51	18	17	17	19	15	21	25	26	46
QC51 – 58	45	50	56	62	25	26	28	26	46
QC58 – 67	40	46	52	57	28	29	31	26	46
QC67 – QC	39	45	52	57	30	31	34	26	46

*Unless designated as a reroute, the corridor is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
**NA = Not applicable

Table 2.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE LOADING ON THE EDGE OF THE RIGHT OF WAY*
(milliGauss)

Corridor**	Existing Power Line				Proposed Power Line - Reroute			Underground	
	2003	2006	2009	2012	2006	2009	2012	2006	2012
Ver	NA***	NA	NA	NA	22	27	31	3.4	4.7
LCR	NA	NA	NA	NA	18	23	26	2.8	4.0
Shel	NA	NA	NA	NA	14	18	21	1.4	2.5
Char	NA	NA	NA	NA	17	21	25	2.5	3.8
NH – V	3	3.3	3.5	3.8	34	42	47	3.4	4.7
V – NF	11	15	17	18	27	35	39	2.8	4.0
NF – C	6.1	10	11	12	25	32	37	2.5	3.8
C – S	1.9	0.8	1.1	1.8	21	28	33	2.1	3.2
S – QC51	14	13	14	16	14	20	24	1.4	2.5
QC51 – 58	45	50	56	62	20	21	22	1.4	2.5
QC58 – 67	38	44	50	54	28	29	31	1.4	2.5
QC67 – QC	37	43	49	53	23	24	27	1.4	2.5

*40 foot ROW for all corridors

** Unless designated as a reroute, the corridor
is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
***NA = Not applicable

Table 3.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT MAXIMUM CONTINUOUS RATED LOAD DIRECTLY UNDER THE OVERHEAD POWER LINE, OVER THE UNDERGROUND TRANSMISSION CABLES AND AT THE EDGE OF THE RIGHT OF WAY

(milliGauss)

Corridor*	Existing Power Line		Proposed Power Line - Reroute		Underground	
	Maximum	ROW Edge**	Maximum	ROW Edge**	Maximum	ROW Edge
Ver	NA***	NA	282	183	519	28
LCR	NA	NA	282	183	519	28
Shel	NA	NA	282	183	519	28
Char	NA	NA	282	183	519	28
NH – V	41	12	282	282	519	28
V – NF	121	96	282	274	519	28
NF – C	121	96	282	274	519	28
C – S	94	75	282	282	519	28
S – QC51	94	75	282	274	519	28
QC51 – 58	176	176	223	189	519	28
QC58 – 67	218	208	281	281	519	28
QC67 – QC	215	204	286	286	519	28

* Unless designated as a reroute, the corridor is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
**40 foot ROW for all corridors
***NA = Not applicable

APPENDIX I

TARGET AT 0 FEET ABOVE GROUND AND DUCT BANK AT 28 INCH DEPTH

Table 1.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE LOADING DIRECTLY UNDER THE OVERHEAD POWER LINE AND OVER THE UNDERGROUND TRANSMISSION CABLES

(milliGauss)

	Existing Power Line				Proposed Power Line - Reroute			Underground	
Corridor*	**2003**	**2006**	**2009**	**2012**	**2006**	**2009**	**2012**	**2006**	**2012**
Ver	NA**	NA	NA	NA	34	42	47	128	177
LCR	NA	NA	NA	NA	28	36	41	106	153
Shel	NA	NA	NA	NA	21	28	33	54	94
Char	NA	NA	NA	NA	26	33	38	96	143
NH – V	10	11	12	13	34	42	47	128	177
V – NF	14	19	21	23	28	36	41	106	153
NF – C	7.6	12	14	15	26	33	38	96	143
C – S	2.4	1	1.4	2.2	21	28	33	79	123
S – QC51	18	17	17	19	15	21	25	54	94
QC51 – 58	45	50	56	62	25	26	28	54	94
QC58 – 67	40	46	52	57	28	29	31	54	94
QC67 – QC	39	45	52	57	30	31	34	54	94

*Unless designated as a reroute, the corridor is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
**NA = Not applicable

Table 2.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE LOADING ON THE EDGE OF THE RIGHT OF WAY*
(milliGauss)

	Existing Power Line				Proposed Power Line - Reroute			Underground	
Corridor**	**2003**	**2006**	**2009**	**2012**	**2006**	**2009**	**2012**	**2006**	**2012**
Ver	NA***	NA	NA	NA	22	27	31	3.5	4.9
LCR	NA	NA	NA	NA	18	23	26	2.9	4.2
Shel	NA	NA	NA	NA	14	18	21	1.5	2.6
Char	NA	NA	NA	NA	17	21	25	2.6	3.9
NH – V	3	3.3	3.5	3.8	34	42	47	3.5	4.9
V – NF	11	15	17	18	27	35	39	2.9	4.2
NF – C	6.1	10	11	12	25	32	37	2.6	3.9
C – S	1.9	0.8	1.1	1.8	21	28	33	2.2	3.4
S – QC51	14	13	14	16	14	20	24	1.5	2.6
QC51 – 58	45	50	56	62	20	21	22	1.5	2.6
QC58 – 67	38	44	50	54	28	29	31	1.5	2.6
QC67 – QC	37	43	49	53	23	24	27	1.5	2.6

*40 foot ROW for all corridors

** Unless designated as a reroute, the corridor
is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
***NA = Not applicable

Table 3.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT MAXIMUM CONTINUOUS RATED LOAD DIRECTLY UNDER THE OVERHEAD POWER LINE, OVER THE UNDERGROUND TRANSMISSION CABLES AND AT THE EDGE OF THE RIGHT OF WAY

(milliGauss)

	Existing Power Line		Proposed Power Line - Reroute		Underground	
Corridor*	**Maximum**	**ROW Edge****	**Maximum**	**ROW Edge****	**Maximum**	**ROW Edge**
Ver	NA***	NA	282	183	1062	29
LCR	NA	NA	282	183	1062	29
Shel	NA	NA	282	183	1062	29
Char	NA	NA	282	183	1062	29
NH – V	41	12	282	282	1062	29
V – NF	121	96	282	274	1062	29
NF – C	121	96	282	274	1062	29
C – S	94	75	282	282	1062	29
S – QC51	94	75	282	274	1062	29
QC51 – 58	176	176	223	189	1062	29
QC58 – 67	218	208	281	281	1062	29
QC67 – QC	215	204	286	286	1062	29

* Unless designated as a reroute, the corridor is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
**40 foot ROW for all corridors
***NA = Not applicable

APPENDIX J

TARGET AT 0 FEET ABOVE GROUND AND DUCT BANK AT 6 INCH DEPTH

Table 1.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE LOADING DIRECTLY UNDER THE OVERHEAD POWER LINE AND OVER THE UNDERGROUND TRANSMISSION CABLES

(milliGauss)

	Existing Power Line				Proposed Power Line - Reroute			Underground	
Corridor*	**2003**	**2006**	**2009**	**2012**	**2006**	**2009**	**2012**	**2006**	**2012**
Ver	NA**	NA	NA	NA	34	42	47	641	886
LCR	NA	NA	NA	NA	28	36	41	528	763
Shel	NA	NA	NA	NA	21	28	33	270	469
Char	NA	NA	NA	NA	26	33	38	481	713
NH – V	10	11	12	13	34	42	47	641	886
V – NF	14	19	21	23	28	36	41	528	763
NF – C	7.6	12	14	15	26	33	38	481	713
C – S	2.4	1	1.4	2.2	21	28	33	397	614
S – QC51	18	17	17	19	15	21	25	270	469
QC51 – 58	45	50	56	62	25	26	28	270	469
QC58 – 67	40	46	52	57	28	29	31	270	469
QC67 – QC	39	45	52	57	30	31	34	270	469

*Unless designated as a reroute, the corridor is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
**NA = Not applicable

Table 2.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT AVERAGE LOADING ON THE EDGE OF THE RIGHT OF WAY*
(milliGauss)

Corridor**	Existing Power Line				Proposed Power Line - Reroute			Underground	
	2003	2006	2009	2012	2006	2009	2012	2006	2012
Ver	NA***	NA	NA	NA	22	27	31	3.6	5.0
LCR	NA	NA	NA	NA	18	23	26	3.0	4.3
Shel	NA	NA	NA	NA	14	18	21	1.5	2.6
Char	NA	NA	NA	NA	17	21	25	2.7	4.0
NH – V	3	3.3	3.5	3.8	34	42	47	3.6	5.0
V – NF	11	15	17	18	27	35	39	3.0	4.3
NF – C	6.1	10	11	12	25	32	37	2.7	4.0
C – S	1.9	0.8	1.1	1.8	21	28	33	2.2	3.4
S – QC51	14	13	14	16	14	20	24	1.5	2.6
QC51 – 58	45	50	56	62	20	21	22	1.5	2.6
QC58 – 67	38	44	50	54	28	29	31	1.5	2.6
QC67 – QC	37	43	49	53	23	24	27	1.5	2.6

*40 foot ROW for all corridors

** Unless designated as a reroute, the corridor
is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
***NA = Not applicable

Table 3.

MAGNETIC POWER FREQUENCY FIELD STRENGTH AT MAXIMUM CONTINUOUS RATED LOAD DIRECTLY UNDER THE OVERHEAD POWER LINE, OVER THE UNDERGROUND TRANSMISSION CABLES AND AT THE EDGE OF THE RIGHT OF WAY

(milliGauss)

	Existing Power Line		Proposed Power Line - Reroute		Underground	
Corridor*	**Maximum**	**ROW Edge****	**Maximum**	**ROW Edge****	**Maximum**	**ROW Edge**
Ver	NA***	NA	282	183	5308	30
LCR	NA	NA	282	183	5308	30
Shel	NA	NA	282	183	5308	30
Char	NA	NA	282	183	5308	30
NH – V	41	12	282	282	5308	30
V – NF	121	96	282	274	5308	30
NF – C	121	96	282	274	5308	30
C – S	94	75	282	282	5308	30
S – QC51	94	75	282	274	5308	30
QC51 – 58	176	176	223	189	5308	30
QC58 – 67	218	208	281	281	5308	30
QC67 – QC	215	204	286	286	5308	30

* Unless designated as a reroute, the corridor is as originally proposed
Ver = Vergennes reroute
LCR = Little Chicago Road reroute
Shel = Shelburne reroute
Char = Charlotte reroute
NH = New Haven substation
V = Vergennes substation
NF = North Ferrisburgh substation
C = Charlotte substation
S = Shelburne substation
QC51-58 = Queen City from poles 51 to 58
QC58-67 = Queen City from poles 58 to 67
QC67-QC = Queen City from pole 67 to substation
**40 foot ROW for all corridors
***NA = Not applicable